Required Effort and Relevance of Results of Site-Dependent Acidification in LCIA

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Required Effort and Relevance of Results of Site-Dependent Acidification in LCIA

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Introduction

Conventional life cycle impact assessment (LCIA) methods do not take into account the location of origin of emissions when calculating impact. Hauschild and Potting (2004) show in several examples how site-dependent LCIA can overcome the lack of accordance between the potential environmental impacts as calculated by life cycle impact assessment and the expected occurrence of actual impacts. However, opponents of site-dependent LCIA argue that the collection of the required spatial information too much burdens inventory analysis, whereas the results of the LCA hardly improve. We therefore quantified the effort to collect the additional spatial data and determined the difference between site-generic and site-dependent LCIA results.

Approach

Three existing LCA studies were selected for an additional analysis: linoleum [2], stone wool [5], and water piping systems [1]. For each case study, the additional data required for site-dependent LCIA of acidification is collected, and the time needed to collect all these data is kept up. The additional data consists of the location where each process takes place (location data) and – where necessary – disaggregating processes into the underlying basic processes (basic data). Next, LCIA is performed with help of the site-dependent acidification factors of the EDIP2003 methodology [3, 4], once by using a site-generic approach, once by using a site-dependent approach. Besides site-dependent factors for European countries, Hauschild and Potting [3] also provide site-generic factors for unlocalizable emissions and for emissions taking place outside of Europe.

Results and discussion

Table 1 lists for each case study the time required to get all the data needed for site-dependent LCIA of acidification. We estimated from this the extra time if site-dependent acidification would have been taken into account right from the start of the LCA. This time is obviously less than the time for our additional analysis, since the performer then already has most of the required data at his disposal.

Table 1 : Time spent by the performer to do the original LCA, and time needed for additional data collection required for site-dependent acidification.

	initial time spent on LCA (by performer)	effort for additional analysis	estimated effort right from the start
linoleum	480 h	84 h	46 h
stone wool	167 h	49 h	11 h
water piping systems	300 h	39 h	10 h

The hours listed in Table 1 reflect the time needed for disaggregation (basic data) and localization (location data) of acidifying emissions. Finding the location hardly took time, because often the report revealed this information. Most time was spent on disaggregating inventory data. Though all reports were rather complete, difficulties occurred because the LCA studies were not fully reproducible. That is, the reports do not contain all information required to redo the impact calculations (sometimes because of confidential processes). This lack of reproducibility is not in line with the ISO recommendations for comparative assertion disclosed to the public. It also makes all kinds of additional analyses on existing LCA studies difficult, not only recalculating the acidifying impact with site-dependent factors.

Figure 1 shows the results of site-dependent acidifying impact assessment. Compared to site-generic acidification, the relative importance of processes changes for site-dependent acidification. Figure 2 exemplifies this for the water piping case. This effect is especially important when the goal of the LCA is to improve the most acidifying processes.

Figure 1 shows that a large portion of the acidification of the linoleum case study originates from emissions located in countries outside of Europe. The lack of compatible site-dependent acidification factors for countries outside of Europe limits a site-dependent treatment of emissions originating from these countries. Site-dependent acidification is therefore presently only feasible when the majority of the emissions take place in European countries.

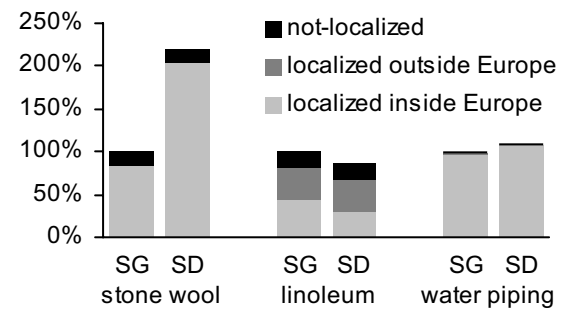

Figure 1: Site-generic (SG) and site-dependent (SD) acidification for each case study. SG is normalized to 100%.

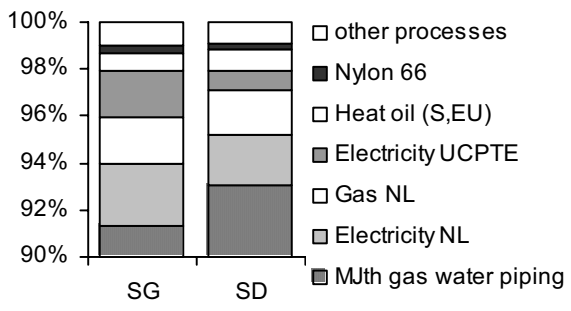

Figure 2: Site-generic (SG) and site-dependent (SD) acidification of water piping systems. Importance of processes.

Conclusion

It was easy to find the location data needed for site-dependent LCIA of the three case studies. However, the necessary disaggregating of processes into basic data took quite some time. Despite ISO recommendations, the three case studies were not fully reproducible, which further hampered easy recalculation of acidification. Due to lack of compatible factors for countries outside Europe, site-dependent calculation of the acidification in LCIA is as to yet only feasible for European emissions.

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